2007 RESEARCH PROBLEM STATEMENT

Problem Title: Retention of Core Competancies **No.:** 07.05-9

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Project Champion: Fred Doehring

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

1. Briefly describe the problem to be addressed.

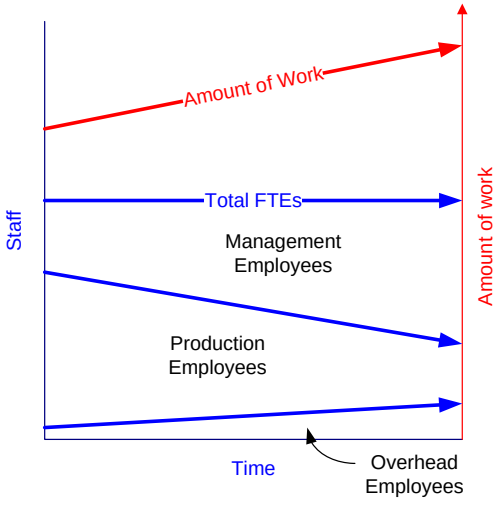
In the Civil Engineering Consulting world there are two basic types of Owners. The first type of Owner is one that has a general idea of what needs to be designed but does not have any in-depth technical knowledge of what needs to be designed. So for example, the Owner may be a developer that hires a Civil Engineering firm to design the roadways, sewers, stormwater systems, etc. for a particular development project. The Owner (the developer in this case) knows that these things must be designed in order for his project to move forward but lacks the ability to design them himself. This type of Owner is often referred to as a "Dumb" client. This is not meant to be derogatory, but rather to reflect the fact that the client does not posses the knowledge and must rely on the consultant to recommend specific solutions.

UDOT, on the other hand, represents the second type of client (as do most DOTs). This type of Owner does posses the knowledge and skills necessary to perform the design themselves, they simply lack sufficient staff and therefore must hire consultants to supplement their in-house abilities. These clients generally have specific design guidelines, processes, and standards that are developed and maintained in-house and which the consultant is required to adhere to. This type of Owner is referred to as a "Smart" client.

Over the past several years UDOT's budget, and therefore the number of projects which it must deliver, has increased at a steady but rapid rate. During this same period our staffing level has remained flat or even decreased somewhat. This has led us to use more and more consultants to deliver our projects. While consultants can certainly take the place of in-house technical staff, there is still a certain amount of UDOT involvement required for each project.

For simplicity's sake we can think of UDOT employees as falling into one of three categories. I will refer to the first category as "Production" staff. Production staff are the designers that design our in-house projects, maintenance employees that push snow and repair guardrail, construction inspectors that oversee the building of our projects, etc. The second category of employees I will refer to as "Management". This includes Project Managers that oversee the delivery of our projects, Resident Engineers that oversee construction, the maintenance supervisory hierarchy, etc. The final group of employees is what I will refer to as "Overhead" employees. This group consists of support staff such as Human Resources, accounting, secretaries, ITS, etc.

The Figure below shows the results of delivering ever more work with a fixed number of FTEs. Because we don't have the staff to perform all technical tasks in house, we hire consultants. However, overseeing the consultants requires staff time including both Management and Overhead employees. Because the total number of FTEs is fixed, the only place to get these Management and Overhead employees is from the ranks of the Production Employees. This, of course, means that we have even fewer Production staff so we must hire more consultants.



Up to a point, this is an acceptable situation. However, at some point our lack of internal Production staff will lead to a lack of technical expertise. Ultimately this will lead us to become, in essence, a "Dumb" client.

The purpose of this proposed research project would be to determine at what point UDOT losses its technical competence in our core competencies. What level of in-house design effort must we maintain in order to retain our core competence? For example, do we need to design 10 bridges per year to retain our bridge design competence? Two bridges? One steel bridge and one concrete bridge? Likewise for Highway design and Hydraulics and Right of Way design, appraisal, and acquisition. Should this effort be expressed as a percentage of the program or is it a defined number of designs?

2. Strategic Goal: ☒ Preservation ☒ Operation ☒ Capacity ☒ Safety (check all that apply)

3A. List the research objective(s) to be accomplished:

1. Determine the minimum levels of staffing required to maintain the Department's core competency in various aspects of highway design, construction, and maintenance.
2.
3.

3B. List the major tasks to accomplish the research objective(s): **Estimated person-hours:** ?

1. Determine what constitutes "core competence" for the various aspects of our business.
2. Determine what level of staffing is required to achieve that competency.
3.

4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B): $30,000

5. Indicate type of research and/or development project this is

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative
☐ Other: _____

(A small project is usually less than $20,000 and shorter than 6 months)

6. Outline the proposed schedule (when do you need this done, and how will we get there):

This should be accomplished before January 1, 2008.

7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

I believe a University would be the best research lead. However, I am not convinced it should be in the Engineering school but probably this is more of a business school type of project.

8A. What deliverables would you like to receive at the end of this project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

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8B. Describe how this project will be implemented at UDOT.

Depending on the results of this study, it may be used as a tool for talks with the Legislature regarding UDOT's staffing level.

8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

UDOT may benefit by achieving the proper staffing level given the amount of work we are asked to perform.

9. Describe the expected risks and obstacles as well as the strategies to overcome them.

Unsure

10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:

Name	Organization / Division / Region	Phone	Email
	University Rep.		
	UDOT Design		
	Structures		
	Maintenance		
	Construction		
	Consulting Rep.?		

10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study:

AASHTO? Other state DOTs?